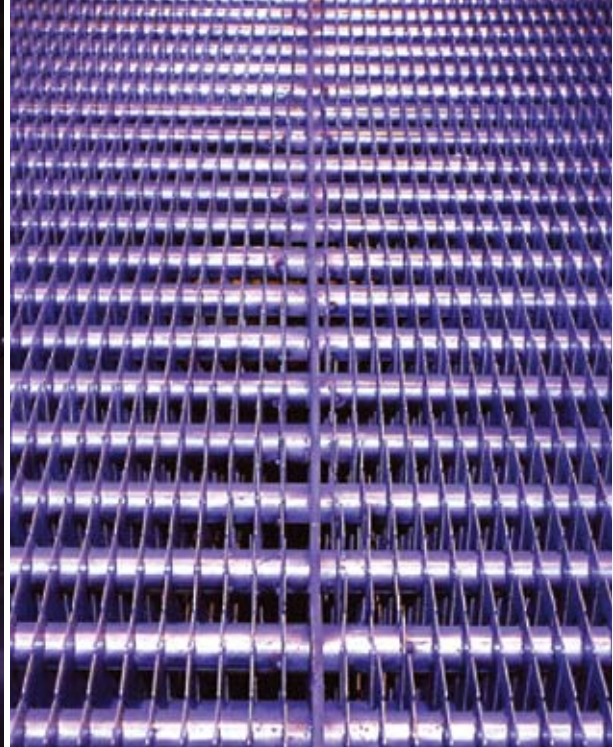


# ENERGY RECOVERY

Customised solutions  
for high-capacity heat exchanger technology





## Complex engineering for maximum energy use



### Expertise in energy recovery

Since 1982, Clyde Bergemann Termotec has been a competent partner for heat exchanger plants. Within the Clyde Bergemann Power Group, Clyde Bergemann Termotec is one of the centres of competence in the field of energy recovery. From development and design to production and true-to-size installation, Clyde Bergemann Termotec provides forward-looking and customised solutions.

A team of highly specialised engineers, in the fields of thermodynamics, process technology, plant engineering and measuring and control technology, designs and builds custom-made heat exchanger plants using state-of-the-art thermodynamic design software. Among others, our engineers work together with Aspen Exchange Design and Rating™, 3D CAD as well as special computer programmes for economiser design and boiler calculation.

Decades of experience and the use of state-of-the-art engineering methods form the basis for material selection and calculation of high-capacity finned tube geometries. Heat exchangers by Clyde Bergemann Termotec reach reliable high degrees of efficiency in relation to their design sizes.

### Customised solutions

Thermodynamic requirements differ in respect of fuels used, temperatures and quantities as well as flue gas characteristics, permissible loss of pressure and specified heat transfer values.

The use of a range of finned tube profiles is the basis for custom-designed geometries which suit varying waste gas requirements.

Whether used as an economiser for feedwater heating, as air preheater, mill air cooler or steam condenser – valuable energy saving potential can be gained with Clyde Bergemann Termotec heat exchanger technology.

### Satisfied customers worldwide

Just like operators of industrial power plants and chemical/petrochemical plants, customers of fossil fuelled power plants for electricity and heat generation rely on our engineering expertise. Our clientele also includes well-known boiler manufacturers.



## Our range of products and services

Main range of application	Industry	Chemistry/ petrochemistry	Power plants
<b>Heat exchanger products</b>			
Economisers			•
Air preheaters			•
Mill air coolers			•
U-tube heat exchangers		•	
Floating head heat exchangers		•	
Air-cooled heat exchangers	•	•	
Air-cooled vacuum condensers	•	•	•
Air-cooled excess pressure condensers	•	•	•
Solvent condensers		•	
Waste heat boilers	•		
<b>Forms of finned tubes</b>			
Steel 'H' / Double 'H' plate fin type			•
CooWeld-fin® spiral tube-type	•	•	•
G-fin spiral tube-type		•	
I-fin spiral tube-type	•		•
L-fin spiral tube-type		•	
Multitube-fin® type	•		



# Special-purpose machines and patented welding technology for superior product quality



## Certified production

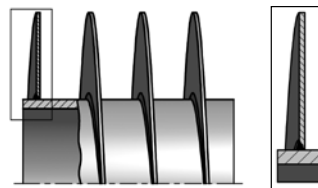
Clyde Bergemann Termotec directs a strong focus on the quality of their products. All machines, including four plate-finned tube and six spiral-finned tube machines, are custom products built to our own specifications.

In-house welding and certified quality assurance engineers monitor all production processes.

Clyde Bergemann Termotec has been certified according to DIN EN ISO 9001:2008. Heat exchangers are produced in compliance with DIN ISO 3834-2 and have been examined by accredited certifiers in accordance with the Pressure Equipment Directive 97/23/EG.

## Patented welding practice

Spiral-finned tubes by Clyde Bergemann Termotec are characterised by their patented welding technology. A continuous metallic weld between fins and tube produces a better heat transfer whereby the economisers can be used in waste heat plants at temperatures of up to 600°C.



Patented welding technology with spiral-finned tubes for maximum heat transfer.





## The range of finned tube forms

### Finned tubes – diversity for optimal results

Finned tubes by Clyde Bergemann Termotec offer crucial advantages for the design of high-capacity heat exchangers. Different finned tube geometries are available depending on the area of application.

Finned tube type	Product description	Area of application
<b>Wire wound finned tubes</b>		
<b>Multitube-fin®</b>	Fins are machine-pressed onto the tubes and connected by means of a skirt. This secures unhindered heat transfer without drifting the tubes thus allowing for the use of thick-walled tubes. Galvanizing can increase this effect.	Large cold vaporizers, air coolers, sand coolers for foundry sand processing plants
<b>I-fin</b>	A-tubes are helically rolled on to the coil material. Fins can be plane-aligned or compressed.	Vaporizer, air heaters, air coolers, gas heaters, oil coolers
<b>L-fin</b>	The L-shaped finning is helically affixed to the tube.	Air coolers, dry cooling towers air condensing plants, air-cooled heat exchangers for the chemical industry
<b>G-fin</b>	The finning is rolled in a helical groove affixed to the face of the tube. This constitutes a connection with high thermal conductivity as well as mechanical and thermal capacitance.	Exhaust gas coolers, air heaters, dry cooling towers, air condensing plants
<b>Welded finned tubes</b>		
<b>CooWeld-fin®</b>	Winding is performed helically; the coil material is inert-gas-welded simultaneously with the A-tube.	Exhaust gas heat exchangers, economisers, steam and hot water generators, exhaust steam boilers for turbines and Diesel generators
<b>Steel 'H' / Double 'H'</b>	The tubes are simultaneously fin-ribbed under an induction weld. Especially suited for dust laden exhaust gases.	Economisers, exhaust steam boilers for turbines and Diesel generators



## Air-cooled heat exchangers, vacuum and excess pressure condensers



### Resource-conserving cooling

Air cooling of heat exchangers and condensers has two crucial advantages: ambient air is available in unlimited quantities and is free of charge.

We design and produce air-cooled vacuum and excess pressure condensers that, for example, are used in the chemical and petrochemical industries worldwide.

Cooling power, compression ratios, ambient temperature, noise protection directives and available footprint make specific demands on the plant and its capacity.

To bring these parameters in line, our engineering is meticulous. A variety of structural shapes – from finned tubes to the arrangement of air coolers to the design of ventilators – allow us to find an optimal solution even for individual customer requirements and structural shapes made to specification.

### Our scope of supply

#### Structural shape of chamber

- Weld-on chamber  
recommended with the use of clean media, high vacuum
- With chamber lid (double-end studs/gudgeons)  
recommended for working pressure of up to 60 bar (designed as gudgeons)
- Plug chamber  
recommended in case of high pressure

#### Mounting arrangements

- Vertical design • Horizontal design • In-line configuration
- Structural shape of roof  
recommended in case of limited footprint

#### Blade forms of axial blower

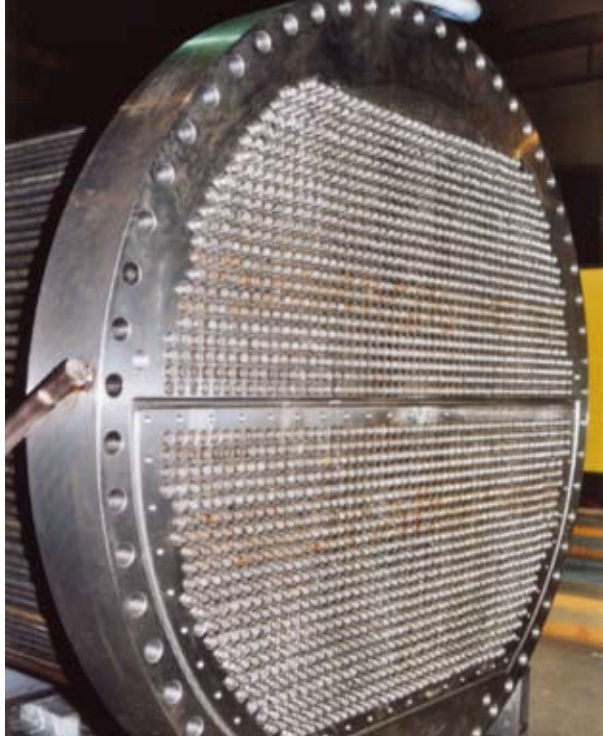
- Selection depending on required noise protection values - available blade forms both meet standard noise level requirements and very strict reference values

#### Blade material of axial blower

- Fibre glass reinforced synthetic material (GRP) • Aluminium



Air-cooled heat exchangers can also be realised in structural shapes made to specification.



## Use in industry and chemical/petrochemical plants

### The focus is on economical process cooling

When used in chemical or petrochemical plants, our products focus on condensation and cooling to recover as much as possible of valuable steam for the process. For producing heat exchanger solutions that are custom-built for the plant, any requested material can be used. It goes without saying that given dimensions and connections provided by the customer as well as statutory specifications for pressure equipment are considered. Depending on the task set, finned cooling tubes of the G-finned or L-finned or Multitube-fin® types are available. Realisation of the design details as to mechanical and welding techniques is also important in order to cope with the operating conditions in a reliable way. Plants for solvent condensation produced by Clyde Bergemann Termotec for industrial recovery of solvents from respective contaminated exhaust air constitute a distinctive feature under economic and environmental perspectives.

### Our references in chemical/petrochemical industry (excerpt)

Plant	Heat exchanger product used	Weight
BASF Ludwigshafen, Germany	Tube bundle heat exchanger	8-36 tons
BASF Antwerpen, Belgium	Air preheater	94 tons
Davillia S.R.L, Italy	Tube bundle heat exchanger	48 tons
Mider Mitteldeutsche Erdöl-Raffinerie, Germany	Tube bundle heat exchanger	2 X 19 tons

### For particularly challenging thermal applications: U-tube heat exchangers

The U-tube heat exchanger is a unit of horizontal or vertical build with U-shape curved heating surface tubes. These are affixed in a tube plate by rolling or welding. The tube bundle insert can be extracted for cleaning or replacement after loosening the bolted joint of the apparatus. The tubes are passed through in a double-flow or multi-flow process depending on procedural operating conditions. Variable design of the pre-chamber can optimise the cost of inspection.



### Floating head heat exchangers

The floating head heat exchanger is a straight pipe heat exchanger with separately gasketed tube and orifice baffles. The heating surface tubes are welded or rolled into the tube plate on both sides. The smaller inside tube plate that is equipped with a head allows for dismantling the tube bundle. Even without dismantling the bundle, the tube can be cleaned using an additional orifice flange connection. This type offers high flexibility as regards pressure and temperature and minimises repairs and maintenance expenses.



## Use in power plants

### Broad range of products and services

Our individually designed economisers, air preheaters and mill air coolers provide efficient energy recovery from exhaust gas streams generated in power plants.

Optimised engineering, true-to-size execution of demands placed on us and a standard of quality at the highest level, guarantee our customers in the power plant industry the requested process stability.

We have long-term experience in the implementation of customer requirements for the most varied compositions of fuel including high portions of biomass co-firing.

### Our references in power plants (excerpt)

Plant	Type of fuel	Heat exchanger product used
Rheinhafen Dampfkraftwerk power plant unit 8, Germany	Hard coal	Economiser
Großkraftwerk Mannheim power plant, Germany	Hard coal	Economiser
Hamm power plant units D & E, Germany	Hard coal	Air preheater & economiser
Eemshaven power plant units A & B, Netherlands	Hard coal	Air preheater



Air preheater



Economiser

